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ABSTRACT

Compared was the relative effectiveness of using games or programed instruction (PI) to transmit information about cognitive similarities between educable mentally retarded (EMR) and nonretarded children to 56 special education teacher trainees. Trainees were randomly assigned to one of two treatment groups (game or PI) or to an attitude control group; and their responses were analyzed to the treatment as well as to a criterion test and a questionnaire concerning attitudes toward handicapped children. Neither method resulted in changed general attitudes about handicapped children. However, PI seemed to be the better choice for Ss because the PI group made significantly fewer errors, took less time to complete the task, and had more members who could correctly state the generalization that EMR and nonretarded children would have the same response. (LH)

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Center for Innovation in Teaching the Handicapped

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THE EFFECTS OF GAMING AND PROGRAMMED INSTRUCTION ON LEARNING OF INDUCTIVE MATERIALS

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THE EFFECTS OF GAMING AND PROGRAMMED INSTRUCTION ON LEARNING OF INDUCTIVE MATERIALS[1]

Candace S. Garrett and Gail Wilcove

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Abstract

Previous studies indicate that teacher trainees have not learned in their courses the conditions under which cognitive similarities between educable mentally retarded (EMR) and non-retarded children exist. This study compared gaming and programmed instruction (PI) as educational methods to use in transmitting a set of inductive learning materials concerning these similarities to special education students. Although the groups using both methods learned the materials at the application level, the PI group made significantly fewer errors, took less time to complete the task, and had more members who could correctly state the generalization on which the materials were based than the game group. In addition, 15% of the game group subjects intensely disliked the game experience, while this problem was not found in the PI group. Neither method resulted in changed general attitudes about handicapped children. On the basis of these results, PI is the better choice for this set of materials with this type of student.

In a recent study (Semmel, Garrett, D. Semmel, & Wilcove, 1973) several groups of college students were asked to select or anticipate the responses of a group of 10- to 14-year-old non-retarded (IQ 90-116) and educable mentally retarded (EMR: IQ 60-89) children to a set of questions which emphasized cognitive processes. These questions had been administered to the children previously so the distributions of responses were known. The college students attributed different responses to the non-retarded and the EMR children, although the normative data indicated that for two-thirds of the questions the most common responses for both groups were identical. The college students were able to anticipate correctly about half of the normal children's responses, but they could correctly anticipate less than a quarter of the EMR children's responses. These students included graduate special education majors who supposedly had been trained to understand the EMR child. These results indicate that students are very aware of the differences between EMR and non-retarded children but are unaware of the similarities. It is important for special education teacher trainees, as well as other teacher trainees, to develop realistic expectations of EMR children's abilities; if their expectations are too low, the results for the children could be quite detrimental.

Since students are not learning in their courses the conditions under which cognitive similarities between EMR and non-retarded children exist, other methods of transmitting this information should be investigated. Which method is best to use is not clear. Two methods that are easily integrated into existing training programs and that are frequently used in education are games and programmed instruction.

Games, as well as more sophisticated methods of simulation, are being used to teach all types of concepts; these include research design and

evaluation (Collett, 1972), medicine (Newsweek, 1972), American government (Boocock & Coleman, 1966; Coleman, 1967), and air pollution (Lindsay, 1972). At the Center for Innovation in Teaching the Handicapped, several games have been developed to teach certain concepts and skills to special education teacher trainees, for example, "Naked Monsters" (Thiagarajan, 1972) and "Anticipation Games" (Semmel, 1972).

According to Inbar and Stoll (1970), educational games have the following characteristics:

1. They permit the learner to explore a system with freedom.
2. They provide feedback on the consequences of actions.
3. They are flexible with regard to the pacing of learning.
4. They offer an opportunity for discovering or uncovering a series of interconnected relationships (p. 13).

In addition, games are motivating and invoke a high degree of learner involvement (Abt, 1970; Boocock & Coleman, 1966; Cherryholmes, 1966; Robinson, 1962). They aid in comprehension, analysis, synthesis, and judgment, and encourage flexibility. They are concerned with developing problem-solving skills and concept learning (Gordon, 1970).

There appears to be general agreement that games are worthwhile educational tools. However, this judgment seems to be based mostly on subjective feelings. There have been very few formal evaluations of educational games.

Boocock and Coleman (1966) gathered questionnaire and test data to determine how two simulation games affected students. Students tended to learn some specific information as well as the major principles of the games. Students reported that they acquired a real feeling for the pro-

cesses simulated, including the complexities of the processes, and gained confidence in their abilities to act effectively in similar real-life situations.

Wing (1966) evaluated the effectiveness of two computer-based economics games with sixth-grade students. A content test concerning economics principles was used to measure learning. There were no differences between the game-playing groups and the control group that learned the material by normal classroom methods. However, it took much less time to learn the material via the gaming method than by regular classroom methods. Hence, the gaming method was more efficient.

Strother, Johnson, and Thompson (1966) conducted two studies using games. Three tests were administered on a pre-post basis: an attitude questionnaire, a motivation test, and a fact and concept test. Results from both studies indicated some positive, but not statistically significant, changes in test scores as a result of playing the games. The authors, however, indicated that these minor gains were offset by increased student time and cost in playing the games.

McKenney (1962) examined the effects of game play on graduate students in the MBA program at Harvard. One section of a course was involved in the regular coursework; the other section played games as well as doing the coursework. A comparison of the final examinations of the groups indicated that the gaming group had learned more planning skills than the control group.

Humphrey (1965, 1966) found that elementary school students who had played games involving verbal and number cues displayed greater learning than when exposed to the same material in conventional workbooks.

Allen, Allen, and Ross (1970) demonstrated that a set of mathematical games, WFF 'N PROOF, is more efficient (produces greater learning in less time) than conventional classroom procedures in teaching symbolic logic and problem-solving skills to junior and senior high school students.

Cherryholmes' (1966) review of six studies on simulation games concluded that games produce more motivation and interest as compared to other teaching techniques but that there are no consistent differences in learning, retention, critical thinking, or attitude change.

As these studies indicate, there are no consistent differences between gaming and other teaching methods. Sometimes game playing results in greater learning; sometimes less. In some cases, it is more efficient in terms of cost and time; in some cases, it is less. But more of the researchers involved in the studies felt gaming was worth further study.

Another method which often is used to teach students educational material is programmed instruction. According to Lumsdaine (1965),

> an instructional program is a vehicle which generates an essentially reproducible sequence of instructional events and accepts responsibility for efficiently accomplishing a specified change from a given range of initial competencies or behavioral tendencies to a specified terminal range of competencies or behavioral tendencies [p. 288].

Although there are several types of programmed instruction, most of them have some common characteristics: (a) they are presented in written form, (b) they provide the learner with relatively immediate feedback about his answers, (c) they are self-paced, and (d) they present an individual learning task[2] (Lange, 1967).

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[2] Often, a low error rate is included as a major characteristic. It was not possible to present the learning material used in this study in any non-trivial PI manner which could result in a low error rate. Hence, only the four characteristics of PI discussed above were incorporated into the material used in this study.

It is not the authors' intention to review the PI literature. Literally hundreds of books and articles have been written on the subject. In general, PI is an effective way to teach some types of materials to some types of students. Schramm (1964), in his survey of the PI research literature, and Ofiesh (1965), in his review of industrial applications, support the view that PI methods are effective and will continue to be used.

There are two major common characteristics between games and PI as utilized in this study. They both are self-paced as opposed to externally paced. In PI, the individual determines how rapidly he will go through the material; in gaming, the group playing the game determines the speed.

Also, both games and PI provide the learner with relatively immediate feedback (knowledge of results). The literature indicates that, although immediate knowledge of results (KOR) is usually cited as universally desirable (Ammons, 1954; Anderson, Kulhavy, & Andre, 1971; Baller & Lower, 1971; Chapaius, 1965; Greenspoon & Foreman, 1956; Schramm, 1964; Sullivan, Schultz, & Baker, 1971), this is not necessarily true. Several recent studies (Crawford, 1966; Geis & Chapman, 1971; Hough & Revsin, 1963; Moore & Smith, 1964) found that various material variables affect whether immediate or delayed KOR is superior or even whether KOR is necessary for learning.

Geis and Chapman (1971), in a review comparing PI with and without KOR, concluded that, in general, KOR did not enhance learning. They suggested that the next step was to determine "how, when, and why... [p. 49]" KOR contributes to effective learning. Crawford (1966) found that delayed KOR was superior for deductive learning, while immediate KOR was superior for inductive learning. In a review by Holland (1965), studies

which utilized materials with high error rates found KOR important to learning; studies with low error rate materials did not find that result.

The materials used in this study require inductive learning and are known to have high error rates (Semmel, Garrett, Semmel, & Wilcove, 1973). Hence KOR should facilitate learning in both the game and PI groups.

The major differences between the game and PI formats as used in this study involve the mode of presentation (written versus mainly verbal) and number of people involved (one versus the game group of four).

The objectives of this study were:

1. to compare two modes of presentation of inductive learning materials, a specific form of gaming and linear programmed instruction, to a control group to determine whether or not these materials could be learned by either method;

2. if learning did occur, to compare the efficacy of the two modes with respect to (a) amount of learning during the task and (b) time to task completion;

3. if learning did occur, to determine which of the two presentation modes would result in greater ability to state and apply the inductive generalization on which the learning materials were based; and

4. to compare the game and PI subjects' general attitudes toward handicapped children to those of a control group to determine whether or not the treatment experience had changed their attitudes.

Method

Subjects

Two sets of subjects were involved in this study. The major portion of the study was conducted at Drake University in Des Moines, Iowa. All

56 students enrolled in summer special education courses served as subjects in the game (N=20), PI (N=20), and attitude control (N=16) groups; these students were working toward certification or a Bachelor's or Master's degree in special education.

A second set of 20 students from Iowa State University served as subjects in the learning control group; these students were enrolled in an upper-level, summer school, undergraduate/graduate course in exceptional children.

Each subject's sex, age, year in school, experience with EMR children, and experience with non-retarded children were tallied from the biographical form. Since the learning control group was obtained at a later date and from a different institution than the treatment and attitude control groups, separate frequency distributions were constructed for each sample. Tables 1 and 2 display these characteristics.

Materials

Four sets of materials were used in this study: the game, a programmed instruction manual, a criterion test, and an Attitudes Toward Handicapped Children Questionnaire. Each is described below. The development of three of these materials was based on the materials and results of the study by Semmel, Garrett, Semmel, & Wilcove (1973), hereafter referred to as the Anticipation Study.

The purpose of the Anticipation Study was to determine the frequency of occurrence of any response by EMR and non-retarded children to a given set of questions. The questions were designed to emphasize cognitive processes rather than academic skills.

TABLE 1

Frequency distribution of subject variables, Drake University sample (game, PI, and attitude control groups)

Sex:	
Male	10
Female	46
Total	56
Age:	
21 and less	14
22 - 30	29
30 and over	13
Total	56
Year in school:	
Junior	7
Senior	23
Grad	26
Total	56
Experience with EMR children:	
None	13
Moderate	32
Extensive	6
Missing data	5
Total	56
Experience with non-retarded children:	
None	2
Moderate	30
Extensive	19
Missing data	5
Total	56

TABLE 2

Frequency distribution of subject variables, Iowa State University sample (learning control group)

Sex:	
Male	5
Female	15
Total	20
Age:	
21 and less	13
22 - 30	5
30 and over	2
Total	20
Year in school	
Junior	4
Senior	12
Graduate	4
Total	20
Experience with EMR children	
None	10
Moderate	9
Extensive	0
Missing data	1
Total	20
Experience with non-retarded children	
None	0
Moderate	13
Extensive	7
Missing data	0
Total	20

The subjects whose responses constituted the initial data base consisted of 66 10- to 14-year-old non-retarded children (IQ 90-116) from lower and lower middle socioeconomic class backgrounds in the Detroit area. The majority of those tested were white males. The retarded population (IQ 60-89) contained 59 children, 11- to 14-years old, of lower socioeconomic status. All of the EMR subjects were male, and half were black.

The normative responses for both EMR and non-retarded children from the Anticipation Study served as the basis for questions used in both the game and the PI materials in this study. All 24 questions used in the Anticipation Study were used; however, only four responses from each question were selected. The four responses were selected on the basis of being a most frequently given response to an item, a common response, or a response that was not ever given.

The game. The game consisted of question cards, response cards, a playing board, counters, and answer sheets used by the gamemaster. Question cards contained the original 24 questions from the Anticipation Study, one per card. A response card contained one response alternative to the question and its corresponding question. There were four response cards associated with each question card.

The playing board was basically decorative in nature (see Figure 1). All players traversed over the path on the board at the same time. Along the path were 24 stopping points, corresponding to the 24 questions. Because of the path construction, the order of the questions was constant each time the game was played. One master marker was moved from stopping point to stopping point. The board also housed the response cards and

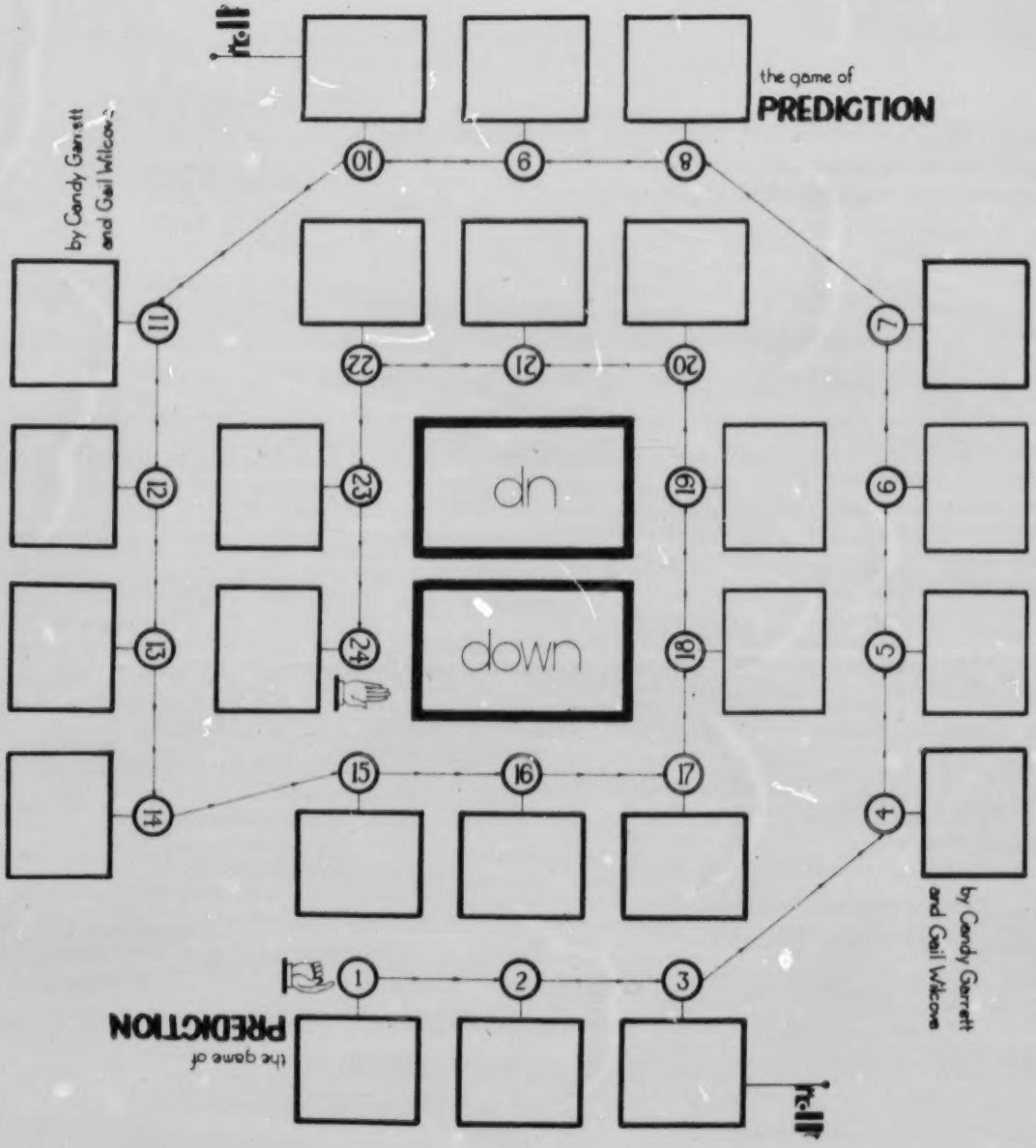

Figure 1. The prediction game board..

question cards. A separate board was used for scoring. There were four columns (one for each player). As the players gave correct responses, they moved up the marked scoring spaces.

As the players moved to a stopping point on the board, the appropriate question card was turned over by the gamemaster. Each player in turn selected a response card and made a prediction before the next player drew his card. Each player was to predict on the basis of the question card in play whether the response he selected was the one most frequently given, given some of the time, or not given at all by both retarded and non-retarded children. The player to the immediate left could disagree and challenge, or pass. If this player challenged, his prediction was stated. The gamemaster then reported the correct answer. The next response card was drawn by player 2 and the process was repeated until all four response cards were drawn for that question. All players then moved to the next stopping point and play resumed with player 2. This rotating continued such that each player drew the first response card in 6 of the 24 questions.

If the player was correct for both populations, he moved his scoring counter up two spaces; if correct for one population he moved up one; and if incorrect for both, his counter was not moved. If the challenger was correct for both populations, his counter was moved up one space; otherwise it did not move. The player whose score was highest at the end of the game won the game. (See Appendix A for a copy of the instructions given to players.)

Programmed instruction manual. The PI manual was constructed to resemble the game as closely as possible. It presented the same 24 questions in a linear format in the same order of presentation as in the game.

The response alternatives that were used in the game were also presented in the written manual. Each frame contained one response alternative with its question. The student was to write in whether that response was the one given most, some, or none of the time for both non-retarded and EMR children. The subject then was provided feedback on the accuracy of his response. (See Appendix B for a copy of the PI manual.)

Criterion test. The criterion test was constructed to determine whether or not the subjects had learned the generalization that the most common responses given by EMR and non-retarded children to questions of this type are identical. The criterion test was in the same format as the treatment materials. There were 24 questions, each with four alternatives. The subject was to indicate the alternatives that were most commonly given to that question by retarded children and non-retarded children. The questions were constructed to be logically similar to those used in the game and PI manual.

Example: Question used in the game and PI manual--

"Puppy goes with dog as kitten goes with _____."

Logically similar question on criterion test--

"Daughter goes with mother as son goes with _____."

The responses to these logically similar questions also were constructed to be similar to the original EMR and non-retarded children's responses.

Example: Responses used in the game and PI manual--

"cat, animal, pet, don't know"

Logically similar responses on criterion test--

"father, man, human, don't know"

Each subject's score on the criterion test consisted of the number of questions on which he attributed the same response to EMR and non-

retarded children. At the end of the criterion test the subjects were instructed to write down anything they had learned throughout the course of the study about EMR and non-retarded children's responses. They also were asked to indicate if they had enjoyed their respective treatment activity. (See Appendix C for a copy of the criterion test.)

Attitudes Toward Handicapped Children Questionnaire. One possible result of the treatments could have been a change in attitude by the subjects toward handicapped children. The authors utilized a questionnaire developed by Efron and Efron (1967) to explore this possibility. The authors revised the scale by eliminating one complete factor and several questions from the other factors in order to shorten time required for completion and to eliminate questions that might be judged offensive by the subjects. The factors remaining were segregation via institutionalization; cultural deprivation; noncondemnatory etiology; personal exclusion; and hopelessness. (See Appendix D for a copy of the questionnaire, explanation of the factors and scoring.)

Procedure

From each class at Drake University, students were randomly assigned to one of three groups, game, PI, or attitude control, with the restriction that each game group contained exactly four subjects. The same E served as gamemaster for each of the resulting five game groups. A second E administered the materials to the PI and attitude control groups.

In each treatment group (game and PI), the Ss first filled out a short biographical form asking for name, sex, age, year in school, and experience with EMR and non-retarded children. The game group then played the game, while the PI group completed the PI materials. Each group then completed the criterion test and the Attitudes Toward Handicapped Children

Questionnaire. The attitude control group filled out the biographical form and then completed the attitudes questionnaire.

The biographical forms and criterion tests were administered by the instructor to a class at Iowa State University consisting of about 40 students. From the completed forms, 20 were chosen for inclusion in the learning control group by attempting to match them as closely as possible to the general characteristics as listed on the biographical forms of the Drake sample.

Data Analysis

Correlations were computed between dependent and subject variables.

From the criterion test, each subject's score consisted of the number of questions in which he attributed the same response to EMR and non-retarded children. A one-way analysis of variance among three groups, two treatment and one learning control, was run using this dependent variable to determine whether or not learning, in terms of applying the generalization, took place in the treatment groups.

The number of people under each experimental condition correctly stating the generalization was analyzed for significance using the chi-square test. This was a direct test of whether the generalization itself was learned.

Subjects in the PI group wrote down their answers during treatment, and these were scored as correct or incorrect based upon the normative data. These scores were grouped into blocks of 24 scores each (six questions with four response frames per question), and the total number correct in that block was scored, thus producing four "trial" scores and a total score per subject. Those subjects playing the game provided a set of answers scored and blocked in a similar method. However, for game

subject scores, the total number of correct responses per block was multiplied by four because each subject only responded once per question, as opposed to subjects in the PI group who responded to all four responses per question. A two-way analysis of variance (game and PI groups by EMR and non-retarded children) with total score as the dependent measure was run to examine learning during treatment. These data were also analyzed by trial blocks--one analysis for non-retarded responses and one for EMR responses.

Two one-way analyses of variance were run among the five game groups, comparing responses to questions normed on EMR and non-retarded children separately, to test whether or not all five groups were homogeneous in responding.

Latency scores for completion of both the game and written questions were analyzed in an analysis of variance to examine time to task completion. For latency scores, each four players of a game constituted a game group and hence were given the same latency score. An efficiency rate (total number correct/time) also analyzed the differences between the two treatment groups. In the game condition, each subject's score again was multiplied by four to equalize opportunity to respond.

Five factor scores were obtained from the Attutides Toward Handicapped Children Questionnaire. An analysis of variance was run for each factor on the two experimental groups and the attitude control group.

Results

Correlational Analysis of Subject and Dependent Variables

Correlations were computed among the subject's demographic information and the dependent measures. The correlation between the two crite-

rion dependent measures, correctly stating the generalization and criterion test score, was positive (r = .36, p < .05); subjects who correctly stated the generalization also tended to receive high test scores. The correlations among enjoyment of the task and all dependent variables (correct statement of generalization, criterion test score, total EMR task score, total non-retarded task score, time to task completion, and efficiency score) were insignificant. Experience with EMR children did not correlate significantly with any of the dependent measures. The correlation between correct statement of the generalization and time to task completion was negative (r = -.47, p < .01); subjects who correctly stated the generalization also tended to complete the task in less time. A correct statement of the generalization and rate on both EMR and non-retarded responses were positively correlated (r (EMR) = .47, p < .01); r (non-retarded) = .43, p < .01). These results are presented in Table 3.

Criterion Test Score Analysis

Criterion test scores were a measure of how well a subject could apply the generalization that on this set of questions the most probable response of both EMR and non-retarded children was the same response. A one-way analysis of variance was run on these test scores for three groups: PI, game, and learning control. A planned comparison of experimental groups showed no significant difference between the game (mean of 13.40 out of 24) and PI (mean of 14.55) groups. When the average of the game and PI groups (13.98) was tested against the control group (mean of 6.25), significance was found in favor of the treatment groups (F = 26.32, df = 1.57, p < .001). This analysis is presented in Table 4.

TABLE 3

Correlations Among Selected Subject Variables and Dependent Measures[a]

	Sex (1=Female 2=Male)	Experience with EMR children	Generalization (1=incorrect 2=correct)	Criterion test score	Enjoyment (1=did 2=didn't)	Total EMR score	Total normal score
Sex							
Exper. EMR	+.08 (70)						
Generalization	-.13 (40)	-.03 (35)					
Crit. Test Score	+.11 (60)	.14 (54)	+.36* (40)				
Enjoyment	+.18 (38)	.05 (33)	+.25 (38)	.18 (38)			
Total EMR Score	+.10 (40)	-.02 (35)	+.13 (40)	.12 (40)	-.07 (38)		
Total Normal Score	-.15 (40)	-.09 (35)	-.01 (40)	.11 (40)	-.15 (38)	.54** (40)	
Time	+.02 (40)	.19 (35)	-.47** (40)	-.12 (40)	-.21 (38)	-.20 (40)	-.28 (40)
EMR Rate	+.01 (40)	-.19 (35)	+.47** (40)	.18 (40)	.19 (38)	.55** (40)	.39* (40)
Normal Rate	-.04 (40)	-.19 (35)	+.43** (40)	.12 (40)	.17 (38)	.40** (40)	.45** (40)

[a]Correlation coefficients are presented first; the number of subjects involved in the ca in parentheses. *$p < .05$ **$p < .01$

TABLE 3

Correlations Among Selected Subject Variables and Dependent Measures[a]

Experience with EMR children	Generalization (1=incorrect 2=correct)	Criterion test score	Enjoyment (1=did 2=didn't)	Total EMR score	Total normal score	Time	EMR rate	Normal rate
-.03 (35)								
.14 (54)	+.36* (40)							
.05 (33)	+.25 (38)	.18 (38)						
-.02 (35)	+.13 (40)	.12 (40)	-.07 (38)					
-.09 (35)	-.01 (40)	.11 (40)	-.15 (38)	.54** (40)				
.19 (35)	-.47** (40)	-.12 (40)	-.21 (38)	-.20 (40)	-.28 (40)			
-.19 (35)	+.47** (40)	.18 (40)	.19 (38)	.55** (40)	.39* (40)	-.88** (40)		
-.19 (35)	+.43** (40)	.12 (40)	.17 (38)	.40** (40)	.45** (40)	-.92** (40)	.97** (40)	

coefficients are presented first; the number of subjects involved in the calculation is indicated

.05 **p < .01

TABLE 4

Analysis of Variance for Criterion Test Scores
for Game, PI, and Learning Control Groups

Source	df	MS	F
Groups	2	404.45	
Game vs. PI	1	13.29	0.53
$\frac{\text{Game} + \text{PI}}{2}$ > Control	1	660.11	26.32***
Error	57	25.08	

*** $p < .001$

Correct Statement of Generalization Analysis

A chi-square analysis assessed the correct statement of the generalization. The χ^2 value ($\chi^2_{\underline{c}}$ = 6.83, $\underline{df}$ = 1, $\underline{p}$ < .01) indicates that the pattern of responses (correct and incorrect) was distributed differently between the PI and game groups. By examining the contingency table (see Table 5), it can be seen that the PI group was superior according to this criterion.

Analysis of Learning During Treatment

The game and PI groups data for total individual treatment scores were analyzed in a two-way repeated-measures analysis of variance. Group and children effects were assessed. Both main effects were significant. The PI group (mean of 52.82 out of 96) scored significantly higher than the game group (mean of 47.00) ($\underline{F}$ = 4.36, $\underline{df}$ = 1, 38, $\underline{p}$ < .05); non-retarded scores (mean of 52.22) were significantly higher than EMR scores (mean of 47.60) ($\underline{F}$ = 8.32, $\underline{df}$ = 1, 38, $\underline{p}$ < .01). Table 6 presents these results.

Trial Analyses

The game and PI groups data for EMR responses across trials were analyzed in a two-way analysis of variance (see Table 7). The PI group (mean of 12.75 out of 24) had significantly higher scores than the game group (mean of 11.05) ($\underline{F}$ = 4.11, $\underline{df}$ = 1, 38, $\underline{p}$ < .05). The trials effect was explored using planned comparisons. The comparisons of trial 1 versus 2 showed trial 2 significantly greater than 1 ($\underline{F}$ = 9.82, $\underline{df}$ = 1, 114, $\underline{p}$ < .01). However, there was no difference between trials 2 and 3 and trials 3 and 4 (where $\bar{X}_1$ = 9.85, $\bar{X}_2$ = 12.40, $\bar{X}_3$ = 12.15, $\bar{X}_4$ = 13.20). The interaction of groups by trials was nonsignificant.

TABLE 5

Number of Subjects who Show Correctly and Incorrectly Stated the Generalization in the Game and PI Groups

	Correct	Incorrect	Total
PI	12	8	20
Game	2	17	20

$\chi^2_c = 6.83^*$, $df = 1$, $p < .01$

* corrected for continuity

TABLE 6

Analysis of Variance for Total Number Correct Treatment Scores for Game and PI Groups on Children (EMR and Non-retarded)

Source	df	MS	F
Between	39	169.15	
Groups (G)	1	678.61	4.36*
Error	38	155.74	
Within	40	60.04	
Children (C)	1	427.81	8.32**
G X C	1	19.01	.37
Error	38	51.44	

* $p < .05$

** $p < .01$

TABLE 7

Analysis of Variance of Game and PI Groups
for EMR Responses Across Trials

Source	df	MS	F
Between	39	30.34	
Group (G)	1	115.60	4.11*
Error	38	28.10	
Within	120	14.74	
Trials (T)	3	82.73	
1 < 2	1	130.02	9.82**
2 < 3	1	1.19	0.09
3 < 4	1	21.98	1.66
G X T	3	3.93	0.30
Error	114	13.24	

* $p < .05$

** $p < .01$

*** $p < .001$

Analysis of game and PI data for non-retarded responses across trials resulted in non-significance for both main effects and the interaction. Table 8 presents these results.

Analysis of Group Homogeneity

The five game groups were examined for differences between groups in their treatment responses for EMR and non-retarded children separately. The main effect was not significant in either analysis (see Table 9). The game groups basically were homogeneous in their responding.

Analysis of Latency Scores

An analysis of variance was run analyzing latency scores for the PI and game groups (see Table 10). This analysis showed that the game condition (mean of 63.00 minutes) took significantly longer than did the PI group (mean of 21.50 minutes) (F = 161.5, df = 1, 23, p < .001).

Analysis of Efficiency Rates

Efficiency rates for groups (PI and game) and children (EMR or non-retarded) were assessed in a two-way analysis of variance. The PI group (mean of 2.49 responses correct per minute) had a significantly greater efficiency rate than did the game group (mean of 0.77) (F = 224.9, df = 1, 38, p < .001), and the responses for the non-retarded children (mean of 1.70) had a significantly higher rate than for the EMR children (mean of 1.56) (F = 13.02, df = 1, 38, p < .001). The interaction was non-significant. This analysis is presented in Table 11.

Analysis of Attitudes Scores

The attitudes questionnaire data were analyzed in a one-way analysis of variance over groups (PI, game, and attitude control) with each of the five factors as a separate dependent variable. There were no significant

TABLE 8

Analysis of Variance of Game and PI Groups for Non-retarded Responses Across Trials

Source	df	MS	F
Between	39	24.60	
Groups (G)	1	58.81	2.48
Error	38	23.70	
Within	120	11.91	
Trials (T)	3	11.77	1.00
G X T	3	15.41	1.30
Error	114	11.82	

TABLE 9

Analysis of Variance of Total Number Correct Treatment Scores for Game Groups

For EMR Responses:

Source	df	MS	F
Groups	4	36.80	.433
Error	15	85.07	

For Non-retarded Responses:

Source	df	MS	F
Groups	4	98.80	1.074
Error	15	92.00	

TABLE 10

Analysis of Variance of Latency Scores
for Game and PI Groups

Source	df	MS	F
Groups	1	6889.00	161.52***
Error	23	42.65	

***$p < .001$

TABLE 11

Analysis of Variance of Efficiency Rates for Game and PI Groups and Children (EMR and Non-retarded)

Source	df	MS	F
Between	39	1.78	224.94***
Groups (G)	1	59.31	
Error	38	.26	
Within	40	.04	
Children (C)	1	.40	13.02***
G X C	1	.02	.62
Error	38	.03	

*** $p < .001$

differences between groups on any of the analyses (see Table 12). Neither the game nor the PI experience changed students' attitudes about handicapped children, at least as measured by this instrument.

Discussion

Although the learning control and experimental groups were not precisely comparable, it is clear that both the game and PI groups learned something about the similarities of the cognitive behaviors of EMR and non-retarded children. Both groups chose the same response for EMR and non-retarded children to the criterion questions much more often than the learning control group did. The control operated at about chance level. Although the treatment groups applied the generalization equally well, the PI group was superior to the game group in the number of subjects who could correctly state the generalization.

During treatment the PI group made significantly fewer errors, took significantly less time to complete the task, and hence had a significantly greater efficiency score than the game group. Both groups learned more during the last three-quarters of the task than during the first quarter, and both anticipated non-retarded children's responses to the questions more accurately than EMR children's. Neither treatment resulted in changed general attitudes about handicapped children.

Inductive types of material can be learned using either the gaming or PI methods. However, PI resulted in the learners forming a correct inductive generalization from the material. This may be due to the fact that the PI group went through the questions, responses, and feedback four times as rapidly as the game group did. Perhaps timing was an important variable in inducing and stating the generalization. The obvious

TABLE 12

Analyses of Variance of Factor Scores for PI, Game, and Attitude Control Groups on the Attitudes Toward Handicapped Children Questionnaire

Segregation via Institutionalization (Factor I):

Source	df	MS	F
Groups	2	30.12	1.59
Error	53	18.89	

Cultural Deprivation (Factor II):

Source	df	MS	F
Groups	2	23.94	1.26
Error	53	18.97	

Noncondemnatory Etiology (Factor III):

Source	df	MS	F
Groups	2	5.57	0.69
Error	53	8.05	

Personal Exclusion (Factor IV):

Source	df	MS	F
Groups	2	53.42	2.10
Error	53	25.44	

Hopelessness (Factor V):

Source	df	MS	F
Groups	2	19.57	2.32
Error	53	8.45	

conclusion is that PI, since it results in more learning, takes less time, and is totally individualized, is the better way to teach this material.

One claim gaming proponents often make is that gaming is highly motivating. This claim was explored by asking the subjects to indicate whether they enjoyed their treatment tasks. Table 13 presents these data. The game condition was enjoyable to more subjects than was the PI condition. However, it was clear to the E from the verbal and written comments made that the three subjects who reported they did not enjoy the game actually intensely disliked it. This extreme was not found in the PI group. Similar results with gaming have been reported elsewhere (Boocock & Coleman, 1966). The subjects who disliked the game appeared to be very threatened by it, as though their teaching ability was being judged by the way they played. This type of student needs to be considered when games are used as learning devices.

This research indicates that gaming and programmed instruction can be effective educational tools. However, at least for this set of inductive materials for use with this type of student, PI is the better choice.

TABLE 13

Subjects' Self-reports of Enjoyment
of Treatment Experience

	Enjoyed N	Did not enjoy N	No response N
PI	12	7	1
Game	16	3	1

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APPENDICES

APPENDIX A

Copy of Instructions Given to Game Players

INSTRUCTIONS FOR THE GAME OF PREDICTION

This game consists of 24 question cards, 96 response cards, a playing board, a scoring board, and 1 master marker. There are four response cards associated with each question card.

THE PLAYING BOARD

All players traverse over the path on the board at the same time. Along the path are 24 stopping points corresponding to the 24 question cards. One master marker will be moved from stopping point to stopping point. The board also houses the response cards and question cards.

THE SCORING BOARD

There are 4 columns (1 for each player). As each player scores, he moves his counter up or down the marked scoring spaces.

THE PLAY

As the players move to a stopping point, the appropriate question card will be turned over by the gamemaster. Each player in turn will select a response card and make a prediction before the next player draws his card. Each player is to predict on the basis of the question card in play whether the response he has selected was the one <u>most</u> frequently given, given <u>some</u> of the time, or <u>not</u> given at all by children ages 11 to 14 of both EMR (IQ 60-89) and normal population. The player to the immediate left may disagree and challenge or pass. If this player challenges, his prediction must then be stated. The gamemaster will then feed back the correct answer as determined by normative data on actual samples of children. The next response card

is drawn by player 2 and the process is repeated until all 4 response cards have been drawn for that question. Each prediction may be used more than once per question or not at all. All players then move to the next stopping point and play resumes with player 2.

SCORING

If a player is correct for both populations, he moves his scoring counter up 2 spaces; if correct for one population he moves up 1; and if incorrect for both, his counter is not moved. If the challenger is correct for both populations, he moves up 1; if correct for only 1 population or incorrect for both, the marker is not moved. The player at the end of the game who has moved his counter up the highest wins the game. The highest possible score is 72.

TO BEGIN PLAY

All players take a counter. The player with the blue counter begins first.

APPENDIX B

PI Manual

You are to proceed through this manual at your own rate. After each question, you are to circle whether the response (indicated by R: _____) associated with each question was the one given most, some, or none of the time by both normal and EMR (IQ 60-89) children 11-14 years of age. After you have circled your prediction, please turn the page for the correct answer. Then proceed to the next question frame. After frame 24 return to the first page and work through the pages again, continuing in this manner until frame 96 is completed. Please record the time upon beginning the manual and upon finishing the manual.

Answer from previous question frame found here	Example:	EMR
	Question: What color is a rainbow?	most, some, none
	R: blue	Normal
		most, some, none

In the above example, if you think most EMR's would answer this question with the response "blue," then you would circle the word "most" under EMR. If you think some normal children would respond with the word "blue," you would circle the work "some" under Normal. Then turn the page for the correct answers.

The responses were determined using normative data on actual samples of children. This is not a measure of your factual knowledge of children but rather how easy it is to predict their behavior.

	1 Question: How would you stop from melting if you were in an ice cube? R: get in freezer	EMR most, some, none Normal most, some, none
	25 Question: If you were locked in a bathroom without a key, how would you get out? R: go out the window	EMR most, some, none Normal most, some, none
	49 Question: What would you do if you were in school and you were the first to find out that the school was on fire? R: call fire dept.	EMR most, some, none Normal most, some, none
	73 Question: What would you do if you wanted to get across a river and couldn't swim? R: drown	EMR most, some, none Normal most, some, none

1 Answer EMR most Normal most	2 Question: How would you stop from melting if you were an ice cube? R: make a snowman	EMR most, some, none Normal most, some, none
25 Answer EMR most Normal most	26 Question: If you were locked in a bathroom without a key, how would you get out? R: scream	EMR most, some, none Normal most, some, none
49 Answer EMR some Normal some	50 Question: What would you do if you were in school and you were the first to find out that the school was on fire? R: run out	EMR most, some, none Normal most, some, none
73 Answer EMR none Normal none	74 Question: What would you do if you wanted to get across a river and couldn't swim? R: build a bridge	EMR most, some, none Normal most, some, none

2 Answer EMR none Normal none	3 Question: How would you stop from melting if you were an ice cube? R: go someplace where it's cold	47 EMR most, some, none Normal most, some, none
26 Answer EMR some Normal some	27 Question: If you were locked in a bathroom without a key, how would you get out? R: kick the door down	 EMR most, some, none Normal most, some, none
50 Answer EMR some Normal some	51 Question: What would you do if you were in school and you were the first to find out that the school was on fire? R: pull fire alarm	 EMR most, some, none Normal most, some, none
74 Answer EMR some Normal some	75 Question: What would you do if you wanted to get across a river and couldn't swim? R: build a raft	 EMR most, some, none Normal most, some, none

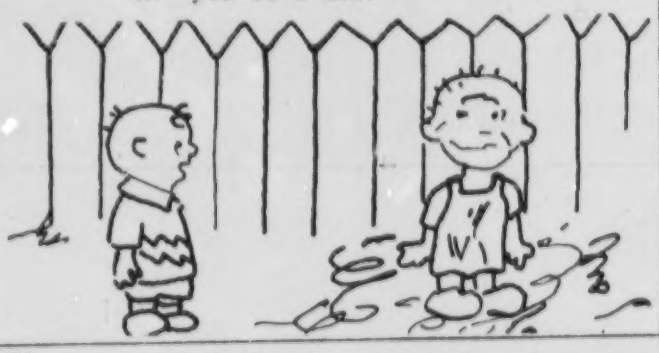
3 Answer EMR some Normal some	4 Question: How would you stop from melting if you were an ice cube? R: I couldn't stop it	49 EMR most, some, none Normal most, some, none
27 Answer EMR some Normal some	28 Question: If you were locked in a bathroom without a key, how would you get out? R: don't know	 EMR most, some, none Normal most, some, none
51 Answer EMR most Normal most	52 Question: What would you do if you were in school and you were the first to find out that the school was on fire? R: try to find a teacher	 EMR most, some, none Normal most, some, none
75 Answer EMR some Normal some	76 Question: What would you do if you wanted to get across a river and couldn't swim? R: take a boat	 EMR most, some, none Normal most, some, none

4 Answer EMR none Normal some	5 Question: All dogs bark. Charlie is a dog. What does Charlie do? R: talks	 EMR most, some, none Normal most, some, none
28 Answer EMR none Normal none	29 Question: How are snow and rain alike? R: both water	 EMR most, some, none Normal most, some, none
52 Answer EMR some Normal some	53 Question: Puppy goes with dog as kitten goes with _____. R: pet	 EMR most, some, none Normal most, some, none
76 Answer EMR most Normal most	77 Question: White goes with black as day goes with _____. R: sun	 EMR most, some, none Normal most, some, none

5 Answer EMR some Normal some	6 Question: All dogs bark. Charlie is a dog. What does Charlie do? R: chases cats	 EMR most, some, none Normal most, some, none
29 Answer EMR most Normal most	30 Question: How are snow and rain alike? R: don't know	 EMR most, some, none Normal most, some, none
53 Answer EMR none Normal none	54 Question: Puppy goes with dog as kitten goes with_____. R: animal	 EMR most, some, none Normal most, some, none
77 Answer EMR some Normal some	78 Question: White goes with black as day goes with_____. R: dark	 EMR most, some, none Normal most, some, none

6 Answer EMR none Normal some	7 Question: All dogs bark. Charlie is a dog. What does Charlie do? R: bark	 EMR most, some, none Normal most, some, none
30 Answer EMR none Normal none	31 Question: How are snow and rain alike. R: both fall	 EMR most, some, none Normal most, some, none
54 Answer EMR none Normal none	55 Question: Puppy goes with dog as kitten goes with _____. R: cat	 EMR most, some, none Normal most, some, none
78 Answer EMR some Normal none	79 Question: White goes with black as day goes with _____. R: night	 EMR most, some, none Normal most, some, none

7 Answer EMR most Normal most	8 Question: All dogs bark. Charlie is a dog. What does Charlie do? R: runs	 EMR most, some, none Normal most, some, none
31 Answer EMR some Normal some	32 Question: How are snow and rain alike? R: both wet	 EMR most, some, none Normal most, some, none
55 Answer EMR most Normal most	56 Question: Puppy goes with dog as kitten goes with _____. R: mitten	 EMR most, some, none Normal most, some, none
79 Answer EMR most Normal most	80 Question: White goes with black as day goes with _____. R: blue	 EMR most, some, none Normal most, some, none

8 Answer EMR some Normal some	9 Question: What kind of friend would a rock make? R: a good one	 EMR most, some, none Normal most, some, none
32 Answer EMR some Normal some	33 Question: How would you feel if you were a leaf on a maple tree? R: stupid/funny	 EMR most, some, none Normal most, some, none
56 Answer EMR some Normal none	57 Question: What do you think Charlie Brown is saying to Pigpen? R: you're a mess 	 EMR most, some, none Normal most, some, none
80 Answer EMR some Normal some	81 Question: Charlie Brown is making a wish. What do you think he is wishing for? R: a dog 	 EMR most, some, none Normal most, some, none

9 Answer EMR some Normal some	10 Question: What kind of friend would a rock make? R: no friend	 EMR most, some, none Normal most, some, none
33 Answer EMR none Normal some	34 Question: How would you feel if you were a leaf on a maple tree? R: just like other leaves	 EMR most, some, none Normal most, some, none
57 Answer EMR some Normal some	58 Question: What do you think Charlie Brown is saying to Pigpen? R: don't know 	 EMR most, some, none Normal most, some, none
81 Answer EMR some Normal some	82 Question: Charlie Brown is making a wish. What do you think he is wishing for? R: about baseball 	 EMR most, some, none Normal most, some, none

10 Answer

EMR

most

Normal

none

11

Question: What kind of friend would a rock make?

R: don't know

EMR

most, some, none

Normal

most, some, none

34 Answer

EMR

some

Normal

none

35

Question: How would you feel if you were a leaf on a maple tree?

R: don't know

EMR

most, some, none

Normal

most, some, none

58 Answer

EMR

some

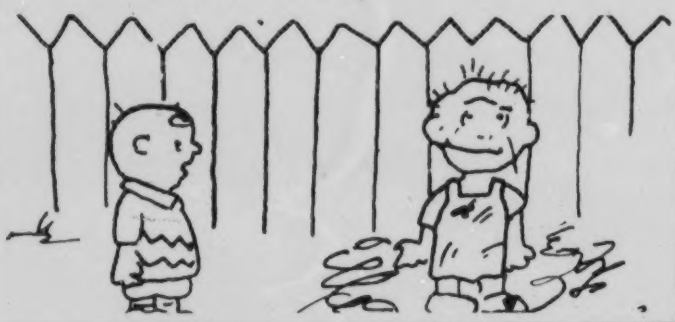
Normal

none

59

Question: What do you think Charlie Brown is saying to Pigpen?

R: you're dirty



EMR

most, some, none

Normal

most, some, none

82 Answer

EMR

some

Normal

most

83

Question: Charlie Brown is making a wish. What do you think he is wishing for?

R: don't know

EMR

most, some, none

Normal

most, some, none

11 Answer EMR some Normal some	12 Question: What kind of friend would a rock make? R: a hard one	65 EMR most, some, none Normal most, some, none
35 Answer EMR some Normal some	36 Question: How would you feel if you were a leaf on a maple tree? R: not so good	EMR most, some, none Normal most, some, none
59 Answer EMR most Normal some	60 Question: What do you think Charlie Brown is saying to Pigpen? R: go take a bath 	EMR most, some, none Normal most, some, none
83 Answer EMR most Normal some	84 Question: Charlie Brown is making a wish. What do you think he is wishing for? R: a friend 	EMR most, some, none Normal most, some, none

12 Answer

EMR

none

Normal

most

13

Question: What number should go in the box where the question mark is?

R: nine

1	2	3	4	5	6	7	8
1		3		5		7	
	2		4		6		?

67

EMR

most, some, none

Normal

most, some, none

36 Answer

EMR

most

Normal

none

37

Question: All boys will become men. John is a boy. What will John become?

R: a father

EMR

most, some, none

Normal

most, some, none

60 Answer

EMR

none

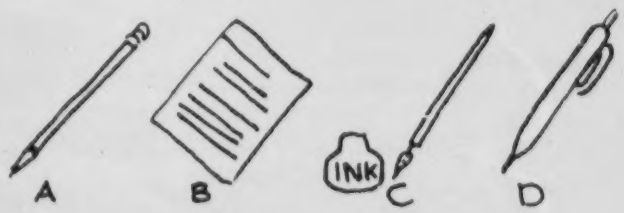
Normal

most

61

Question: What item does not belong in this picture?

R: "B"



EMR

most, some, none

Normal

most, some, none

84 Answer

EMR

some

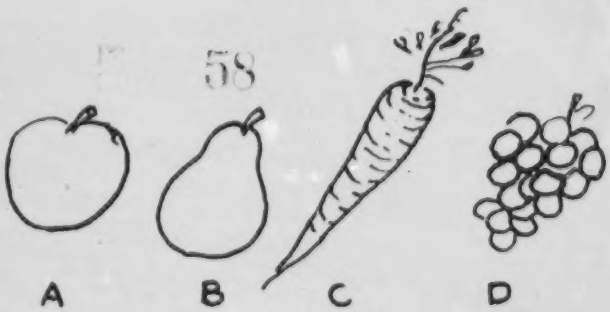
Normal

some

85

Question: What item does not belong in this picture?

R: don't know



EMR

most, some, none

Normal

most, some, none

13 Answer

EMR

some

Normal

some

14

Question: What number should go in the box where the question mark is?

R: don't know

1	2	3	4	5	6	7	8
1		3		5		7	
	2		4		6		?

EMR

most, some, none

Normal

most, some, none

37 Answer

EMR

none

Normal

none

38

Question: All boys will become men. John is a boy. What will John become?

R: old

EMR

most, some, none

Normal

most, some, none

61 Answer

EMR

most

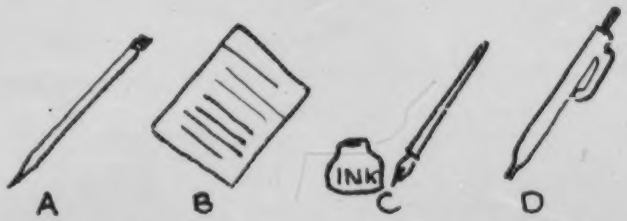
Normal

most

62

Question: What item does not belong in this picture?

R: "D"



EMR

most, some, none

Normal

most, some, none

85 Answer

EMR

none

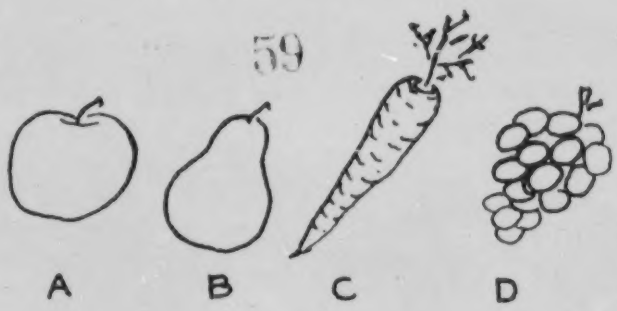
Normal

none

86

Question: What item does not belong in this picture?

R: "D"



EMR

most, some, none

Normal

most, some, none

14 Answer

EMR

none

Normal

none

15

Question: What number should go in the box where the question mark is?

R: eight

1	2	3	4	5	6	7	8
1		3		5		7	
	2		4		6		?

EMR

most, some, none

Normal

most, some, none

38 Answer

EMR

none

Normal

none

39

Question: All boys will become men. John is a boy. What will John become?

R: don't know

EMR

most, some, none

Normal

most, some, none

62 Answer

EMR

some

Normal

some

63

Question: What item does not belong in this picture?

R: "C"

EMR

most, some, none

Normal

most, some, none

86 Answer

EMR

some

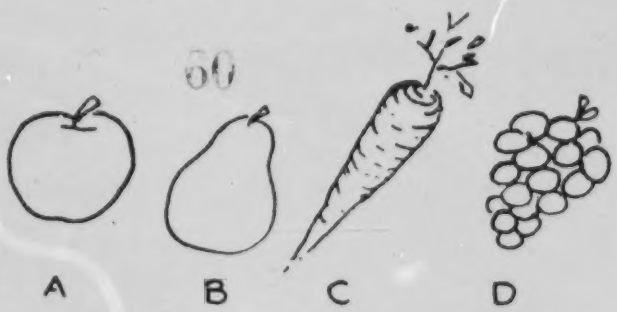
Normal

some

87

Question: What item does not belong in this picture?

R: "C"



EMR

most, some, none

Normal

most, some, none

15 Answer

EMR

most

Normal

most

16

Question: What number should go in the box where the question mark is?

R: seven

1	2	3	4	5	6	7	8
1		3		5		7	
	2		4		6		?

EMR

most, some, none

Normal

most, some, none

39 Answer

EMR

none

Normal

none

40

Question: all boys will become men. John is a boy. What will John become?

R: a man

EMR

most, some, none

Normal

most, some, none

63 Answer

EMR

some

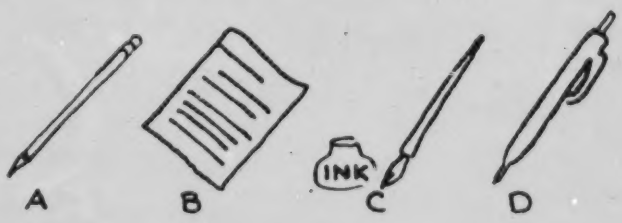
Normal

some

64

Question: What item does not belong in this picture?

R: paper



EMR

most, some, none

Normal

most, some, none

87 Answer

EMR

most

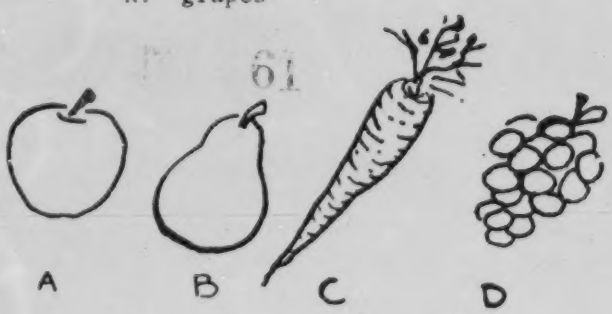
Normal

most

88

Question: What item does not belong in this picture?

R: grapes



EMR

most, some, none

Normal

most, some, none

16 Answer

EMR

some

Normal

some

17

Question: What would you do if you wanted something that cost more than you had?

R: wouldn't buy it

75

EMR

most, some, none

Normal

most, some, none

40 Answer

EMR

most

Normal

most

41

Question: What goes in the box?

R: ton

TOP	POT
TAB	BAT
RAT	TAR
TON	?

EMR

most, some, none

Normal

most, some, none

64 Answer

EMR

none

Normal

none

65

Question: What is the first thing that comes to your mind when I mention the word teacher?

R: nothing

EMR

most, some, none

Normal

most, some, none

88 Answer

EMR

none

Normal

none

89

Question: What's a whatchamacallit?

R: nothing

EMR

most, some, none

Normal

most, some, none

17 Answer

EMR

none

Normal

some

18

Question: What would you do if you wanted something that cost more than you had?

R: go home and get more money

EMR

most, some, none

Normal

most, some, none

41 Answer

EMR

some

Normal

some

42

Question: What goes in the box

R: question mark

TOP	POT
TAB	BAT
RAT	TAR
TON	?

EMR

most, some, none

Normal

most, some, none

65 Answer

EMR

none

Normal

none

66

Question: What is the first thing that comes to your mind when I mention the word teacher?

R: work

EMR

most, some, none

Normal

most, some, none

89 Answer

EMR

some

Normal

some

90

Question: What's a whatchamacallit?

R: don't know

EMR

most, some, none

Normal

most, some, none

18 Answer

EMR

most

Normal

none

19

Question: What would you do if you wanted something that cost more than you had?

R: ask a parent

EMR

most, some, none

Normal

most, some, none

---

42 Answer

EMR

none

Normal

none

43

Question: What goes in the box?

R: not

TOP	POT
TAB	BAT
RAT	TAR
TON	?

EMR

most, some, none

Normal

most, some, none

---

66 Answer

EMR

most

Normal

some

67

Question: What is the first thing that comes to your mind when I mention the word teacher?

R: school

EMR

most, some, none

Normal

most, some, none

---

90 Answer

EMR

most

Normal

most

91

Question: What is a whatchamacallit?

R: anything

EMR

most, some, none

Normal

most, some, none

19 Answer

EMR

some

Normal

some

20

Question: What would you do if you wanted something that cost more than you had?

R: save for it

EMR

most, some, none

Normal

most, some, none

43 Answer

EMR

some

Normal

most

44

Question: What goes in the box?

R: don't know

TOP	POT
TAB	BAT
RAT	TAR
TON	?

EMR

most, some, none

Normal

most, some, none

67 Answer

EMR

some

Normal

most

68

Question: What is the first thing that comes to your mind when I mention the word teacher

R: learning

EMR

most, some, none

Normal

most, some, none

91 Answer

EMR

some

Normal

some

92

Question: What's a whatchamacallit?

R: something you forget the name of

EMR

most, some, none

Normal

most, some, none

20 Answer

EMR

some

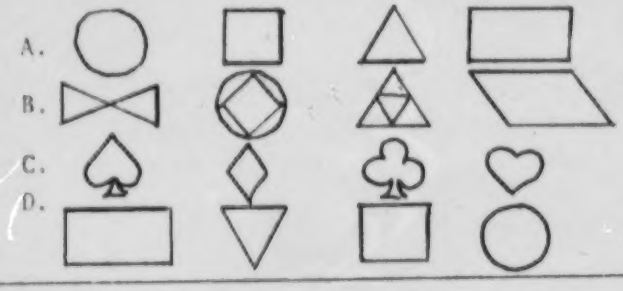
Normal

most

21

Question: Which of the following sets of figures are found in a stack of playing cards?

R: "C"



83

EMR

most, some, none

Normal

most, some, none

44 Answer

EMR

most

Normal

some

45

Question: What is the difference between a cow and a bull?

R: cow is female, bull is male

EMR

most, some, none

Normal

most, some, none

68 Answer

EMR

some

Normal

some

69

Question: What is the first thing that comes to your mind when I mention the word mother?

R: mom

EMR

most, some, none

Normal

most, some, none

92 Answer

EMR

none

Normal

some

93

Question: A hat on a head is like ice cream on a _____.

R: don't know

EMR

most, some, none

Normal

most, some, none

21 Answer

EMR

most

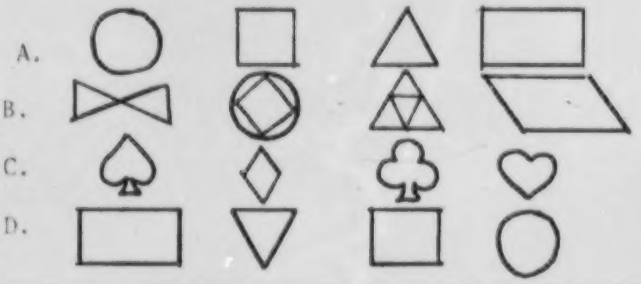
Normal

most

22

Question: Which of the following sets of figures are found in a deck of playing cards?

R: hearts



85

EMR

most, some, none

Normal

most, some, none

45 Answer

EMR

some

Normal

some

46

Question: What is the difference between a cow and a bull?

R: bull has horns

EMR

most, some, none

Normal

most, some, none

69 Answer

EMR

some

Normal

some

70

Question: What is the first thing that comes to your mind when I mention the word mother?

R: father

EMR

most, some, none

Normal

most, some, none

93 Answer

EMR

none

Normal

none

94

Question: A hat on a head is like ice cream on a _____.

R: stick

EMR

most, some, none

Normal

most, some, none

22 Answer

EMR

none

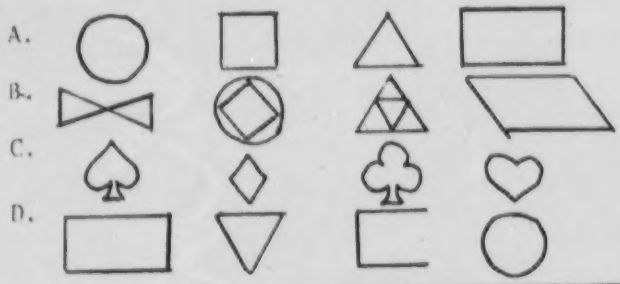
Normal

none

23

Question: Which of the following sets of figures are found in a deck of playing cards?

R: no response



87

EMR

most, some, none

Normal

most, some, none

46 Answer

EMR

most

Normal

most

47

Question: What is the difference between a cow and a bull?

R: don't know

EMR

most, some, none

Normal

most, some, none

70 Answer

EMR

most

Normal

most

71

Question: What is the first thing that comes to your mind when I mention the word mother?

R: pretty

EMR

most, some, none

Normal

most, some, none

94 Answer

EMR

some

Normal

some

95

Question: A hat on a head is like ice cream on a _____.

R: bed

EMR

most, some, none

Normal

most, some, none

23 Answer

EMR

some

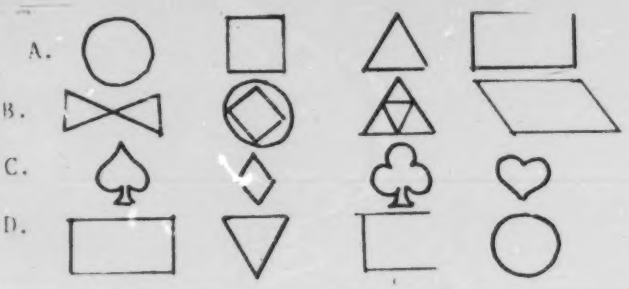
Normal

none

24

Question: Which of the following sets of figures are found in a deck of playing cards?

R: don't know



89

EMR

most, some, none

Normal

most, some, none

47 Answer

EMR

some

Normal

some

48

Question: What is the difference between a cow and a bull?

R: bulls fight

EMR

most, some, none

Normal

most, some, none

71 Answer

EMR

none

Normal

none

72

Question: What is the first thing that comes to your mind when I mention the word mother?

R: love

EMR

most, some, none

Normal

most, some, none

95 Answer

EMR

some

Normal

some

96

Question: A hat on a head is like ice cream on a _____.

R: cone

EMR

most, some, none

Normal

most, some, none

24 Answer EMR none Normal none		91
48 Answer EMR some Normal some		
72 Answer EMR some Normal some		
96 Answer EMR most Normal most		

APPENDIX C

Criterion Test

For Game Group:

Read each question and the four responses following it. Suppose you were to give the question to two groups of children, normal and educable mentally retarded (IQ 60-89) ages 11-14. Which of the following four answers do you think would be the one most commonly given by each group of children. Indicate your choices by putting the corresponding response letters in the proper boxes.

PI groups' instructions (see next page):

Example:

Question: What color is a rainbow?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) blue		
b) red	☐	☐
c) rain		
d) don't know		

If you think that EMR children would most commonly answer "blue" to the above question, put an "a" corresponding to the response "blue" in the box under "EMR"; if you think normal children would most commonly answer "red" to the above question, put a "b" corresponding to that response in the box under "Normal." Both populations may or may not respond indentically.

Name_____

For PI Group:

This manual contains questions and responses similar to ones you have previously seen. Read each question and the four responses following it. Select the response that you think was most commonly given by EMR children ages 11-14 and the one most commonly given by normal children ages 11-14. Indicate your choices by putting the corresponding response letter in the proper boxes.

Example:

Question: What color is a rainbow?

Indicate the letter of the response most commonly given by by both groups of children.

	EMR	Normal
a) blue		
b) red	☐	☐
c) rain		
d) I don't know		

If you think that EMR children would most commonly answer "blue" to the above question, put an "a" corresponding to the response "blue" in the box under "EMR"; if you think normal children would most commonly answer "red" to the above question, put a "b" corresponding to that response in the box under "Normal".

Name_____

1. Question: How would you stop from burning if you were on fire?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) go some place where there's water		
b) I couldn't	☐	☐
c) get the fire dept.		
d) get wet		

2. Question: All cats meow. Fluffy is a cat. What does Fluffy do?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) meows		
b) chases	☐	☐
c) plays with yarn		
d) don't know		

3. Question: What kind of friend would a flower make?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) a pretty friend		
b) a good smelling one	☐	☐
c) don't know		
d) no friend		

4. Question: What letter should go in the box under where the question mark is?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) "G"		
b) "H"	☐	☐
c) "F"		
d) "E"		

A	B	C	D	E	F	G
A		C		E		?
	B		D		F	

5. Question: Suppose you wanted to go to the movies but your mother said you couldn't go. What would you do?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) ask my father		
b) cry	☐	☐
c) go anyway		
d) go later		

6. Question: Which of the following sets of letters will be found on a compass?

Indicate the letter of the response most commonly given by both groups of children.

a) A B C D

b) N S E W

c) M W X O

d) F G I K

EMR	Normal
☐	☐

7. Question: If you were locked outside your house without a key and it started to rain, what would you do?

Indicate the letter of the response most commonly given by both groups of children.

a) go next door

b) get wet

c) go in a window

d) scream

EMR	Normal
☐	☐

8. Question: How are boots and sandals alike?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) both shoes		
b) wear them	☐	☐
c) both made out of leather		
d) don't know		

9. Question: How would you feel if you were a fish in the water?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) wet		
b) don't know	☐	☐
c) just like other fish		
d) scared cause I can't swim		

10. Question: All children become adults. Mary is a child. What will Mary become?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) adult		
b) mother	☐	☐
c) girl		
d) don't know		

11. Question: What goes in the empty box?

Indicate the letter of the response most commonly given by both groups of children.

a) 765
b) nothing
c) don't know
d) 567

	EMR	Normal
	☐	☐

abc	cba
123	321
xyz	zyx
567	

12. Question: What's the difference between a hen and a rooster?

Indicate the letter of the response most commonly given by both groups of children.

a) hen is female, rooster is male
b) hens lay eggs
c) rooster cock-a-doodle-dos
d) don't know

	EMR	Normal
	☐	☐

13. Question: What would you do if you were in the school yard and you were the first to find a lost baby there?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) get a policeman		
b) try to find its mother	☐	☐
c) get a teacher or the principal		
d) nothing		

14. Question: Daughter goes with mother as son goes with_____.

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) father		
b) man	☐	☐
c) human		
d) fun		

15. Question: What do you think Snoopy is saying to Woodstock?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) What are you doing?		
b) Hi!	☐	☐
c) don't know		
d) Type me a letter!		

16. Question: What item does not belong in this picture?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) "A"		
b) "B"	☐	☐
c) "C"		
d) "D"		

17. Question: What's the first thing that comes to mind when I mention the word "doctor"?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) hospital		
b) shots	☐	☐
c) nurse		
d) nothing		

18. Question: What's the first thing that comes to mind when I mention the word "sister"?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) brother		
b) girl	☐	☐
c) love		
d) don't know		

19. Question: What would you do if you went to a swimming pool to go swimming but forgot your bathing suit?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) swim in my clothes		
b) go home	☐	☐
c) call my mother and tell her to bring it		
d) watch the other kids		

20. Question: Beginning goes with end as hello goes with _____.

Indicate the letter of the response most commonly given by both groups of children.

a) good-bye
b) hi
c) send
d) smile

EMR	Normal
☐	☐

21. Question: Snoopy is making a wish. What do you think he's wishing for?

Indicate the letter of the response most commonly given by both groups of children.

a) a bone
b) don't know
c) about baseball
d) a new house

EMR	Normal
☐	☐

22. Question: What item does not belong in this picture?

Indicate the letter of the response most commonly given by both groups of children.

A B C D

	EMR	Normal
a) "B"		
b) "C"	☐	☐
d) horse		
e) don't know		

23. Question: Who's whatshername?

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) don't know		
b) anyone	☐	☐
c) a person		
d) someone you forgot the name of		

24. Question: A bird in the air is like a fish in the_____.

Indicate the letter of the response most commonly given by both groups of children.

	EMR	Normal
a) water		
b) tank	☐	☐
c) hair		
d) don't know		

What have you learned about EMR and normal children from participating in this game?

Did you enjoy playing this game? Yes ☐ No ☐

Comments:

APPENDIX D

Attitudes Toward Handicapped Children Questionnaire, Factor Explanation, and Factor Scoring

We would appreciate your opinion on each of the statements found in this questionnaire. Read each statement and respond by circling a "1" if you "strongly disagree" with the statement, a "2" if you "disagree," a "3" if you are "not sure but probably disagree," a "4" if you are "not sure but probably agree," a "5" if you "agree," or a "6" if you "strongly agree."

Example:

The most important principle in teaching retardates is to protect them against experiencing failure.

1 2 3 4 5 6

/ / / / / / /

If you agree with this statement, you would circle 5.

For purposes of this questionnaire, by retardates we mean individuals who are in the educable classification, that is those with IQs of at least 50.

Key:	1	2	3	4	5	6
	strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

1. With the current trend in industrial technology, there are going to be fewer jobs that retardates can fill.

1	2	3	4	5	6

2. Retardates are responsible for more crimes than their proportion in the population.

1	2	3	4	5	6

3. Any perfectly normal parents may have a retarded child.

1	2	3	4	5	6

4. Beautiful children seldom are retarded.

1	2	3	4	5	6

5. As sad as it is to admit it, there really is little hope for the mentally retarded.

1	2	3	4	5	6

6. To be perfectly honest, this world would be a safer place to live in if there were no mentally retarded.

1	2	3	4	5	6

1	2	3	4	5	6
strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

7. It is wrong to laugh at a mental retardate.

1	2	3	4	5	6

8. A substantial cause of mental retardation is cultural and educational impoverishment.

1	2	3	4	5	6

9. Premature children are more likely to be mentally retarded than full-term children.

1	2	3	4	5	6

10. Programs, such as Headstart, that broaden the child's experience at an early age, prevent cases of mental retardation.

1	2	3	4	5	6

11. Retardates should live among themselves and everything should be done to help them live happy lives.

1	2	3	4	5	6

12. The majority of the mentally retarded are the children of the more disadvantaged classes of our society.

1	2	3	4	5	6

1	2	3	4	5	6
strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

13. Mental retardation often leads to mental illness.

1	2	3	4	5	6

14. Because of their condition, the mentally retarded are easily led into criminal ways.

1	2	3	4	5	6

15. It must be hard to forgive yourself if you have a child who is mentally retarded.

1	2	3	4	5	6

16. Mentally retarded children should live in special institutions where they can be supervised and protected.

1	2	3	4	5	6

17. I don't feel it is fair to your child to let him play with a mentally retarded child.

1	2	3	4	5	6

18. The more severe cases of mental retardation are likely to be associated with organic defects.

1	2	3	4	5	6

1	2	3	4	5	6
strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

19. Once someone is retarded little can be done for him.

1	2	3	4	5	6

20. Whether a child is born retarded is most often a matter of chance.

1	2	3	4	5	6

21. It would be kinder to establish separate communities for retardates where they would not feel so out of place.

1	2	3	4	5	6

22. Expecting retardates to fit into our highly competitive society is expecting too much.

1	2	3	4	5	6

23. In many instances, illiteracy and mental retardation are indistinguishable.

1	2	3	4	5	6

24. Employer prejudice is a greater detriment to the retardate than lack of ability.

1	2	3	4	5	6

1	2	3	4	5	6
strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

25. It is unwise to trust a younger child with an older retardate.

1	2	3	4	5	6

26. There is a sharp dividing line between "normal" and "mentally retarded."

1	2	3	4	5	6

27. Separate schools for the retarded would provide them with the special programs they need.

1	2	3	4	5	6

28. Retardates should be prevented from having children by a painless operation.

1	2	3	4	5	6

29. Decent parents are just as likely to have a mentally retarded child as any other parents.

1	2	3	4	5	6

30. Mental retardation is no different from any physical handicap.

1	2	3	4	5	6

1	2	3	4	5	6
strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

31. A mental retardate can live just as happy a life as a normal person.

1	2	3	4	5	6

32. It is unfair to the normal children to have retardates in the same classroom.

1	2	3	4	5	6

33. A mental retardate can live just as useful a life as a normal person.

1	2	3	4	5	6

34. I could see myself having a mental retardate as a true friend.

1	2	3	4	5	6

35. I would do everything in my power to prevent my daughter from marrying a mental retardate.

1	2	3	4	5	6

36. Except for the fact that they are not too smart, mental retardates are the same as other children.

1	2	3	4	5	6

1	2	3	4	5	6
strongly disagree	disagree	not sure but probably disagree	not sure but probably agree	agree	strongly agree

37. You can generally identify a retardate by his looks.

1	2	3	4	5	6

38. I'd rather have a child born dead than mentally retarded.

1	2	3	4	5	6

39. I would trust a mentally retarded person as a baby-sitter.

1	2	3	4	5	6

40. If I had a retarded child I'd feel ashamed.

1	2	3	4	5	6

41. Most mental retardates are better off in an institution with others of their kind.

1	2	3	4	5	6

42. Retardates are generally happier when with normals than when they are in special institutions.

1	2	3	4	5	6

Segregation via Institutionalization (Factor I):
"this factor projects the view that the retardate should be removed from the mainstream of society since he represents a threat to its members" (p. 102)*.

Cultural Deprivation (Factor II):
"this factor embodies the belief that cultural impoverishment is a significant contributor to mental retardation" (p. 102).

Noncondemnatory Etiology (Factor III):
"persons scoring high on this factor tend to reject the notion that there is shame in rearing a retardate, are prone to feel it is wrong to humiliate him, and generally see retardation as no different from any physical handicap" (p. 104).

Personal Exclusion (Factor IV):
"the unique aspect of this factor lies in the sense of personal tragedy that retardation implies" (p. 104).

Hopelessness (Factor V)**:
"this...factor projects a pessimistic view of the prospects in store for the retardate" (p. 105).

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*All page references are to the Efron and Efron (1967) article.

**Factor V in the original scale is a factor called "Authoritarianism." Many of the items that loaded highly in this factor were eliminated; it was felt that they would be considered objectionable by the subjects in this study. Hence, the entire factor was eliminated. "Hopelessness" originally was Factor VI.

Segregation via Institutionalization (Factor I) =

Σ(nos. 4, 6, 11, 16, 17, 19, 21, 26, 36)

Cultural Deprivation (Factor II) =

Σ(nos. 8, 9, 10, 12, 18, 23)

Noncondemnatory Etiology (Factor III) =

Σ(nos. 3, 7, 20, 29, 30) - (no. 40)

Personal Exclusion (Factor IV) =

Σ(nos. 15, 27, 28, 32, 35, 38) - Σ(nos. 34, 36, 39, 42) + 16*

Hopelessness (Factor V) =

Σ(nos. 1, 2, 5) - Σ(nos. 24, 31, 33) + 14*

*Constants were added to avoid negative scores.